Iberian paleogeography traced by U-Pb zircon ages of Ediacaran-Cambrian rocks

RITA SOLÁ[1*], FRANCISCO PEREIRA[2, 5], MARTIM CHICHORRO[3], LUÍS LOPES[2], AXEL GERDES[4] AND J.BRANDÃO SILVA[5]

[1] Laboratório Nacional de Energia e Geologia and Centro de Geociências, Portugal, rita.sola@lneg.pt (* presenting author)
[2] Dep. de Geociências, Universidade de Évora, Portugal
[3] Dep. de Ciências da Terra, Universidade Nova de Lisboa, Portugal
[4] Institut für Geowissenschaften, Frankfurt am Main, Germany
[5] Instituto Dom Luiz, Universidade de Lisboa, Portugal

The stratigraphic sequence of the Estremoz Anticline in the Ossa-Morena Zone (SW Iberia) includes: 1) an Neoproterozoic basement in the core - Série Negra Succession with greywackes, pelites and black cherts - unconformably overlain by 2) a lower Cambrian Dolomitic Formation, with arkosic sandstones and dolomitic limestones followed by 3) a Volcanic-Sedimentary Complex (VSC) with rhyolites and basalts interbedded with pelites and marbles.

The age of the VSC of the Estremoz Anticline has been a matter of debate, either due to the scarcity of fossils or to the complexity of the regional Variscan deformation. It was firstly attributed to the lower Cambrian, latter reported to the Ordovician or even to the Silurian [1]. Recently, a new interpretation attributed an upper Silurian to Devonian age to the VSC based on a lithological correlation with fossiliferous detritic carbonate rocks that outcrop in the vicinity of the Estremoz Anticline [2].

In this study we present new U-Pb ages of zircons from the Estremoz Anticline stratigraphic sequence.

The spectra of detrital zircon ages of the Ediacaran greywackes (Série Negra Succession) and lower Cambrian arkosic sandstones (Dolomitic Formation) indicates a predominance of Neoproterozoic ages (69-86%) and few Paleoproterozoic (10-16%) and Archean (2-12%) ages. The spectra of Proterozoic detrital zircon ages (with a typical gap in Mesoproterozoic ages) are similar to other peri-Gondwana correlatives with West African Craton provenance [3]. The source area is characterized by an important population of zircon ages in the range c. 850-545Ma. These Cryogenian and Ediacaran ages correspond to zircon crystallization events related to North Gondwana assembly during Pan-African/Cadomian orogenic processes.

The metarhyolites that are interbedded in the marbles of the VSC yielded a magmatic zircon crystallization age of 499.4 ± 3.3 Ma (MSWD=1.16; n=15/16; upper Cambrian). The result obtained indicates that carbonate production was episodic and occurred during lower and upper Cambrian in SW Iberia, related to North-Gondwana break-up. This new evidence should be taken into account in the reshaping of paleogeographic reconstruction models that have erroneously insisted on placing Iberia at southerly cold water higher latitudes (>60ºS) during the Furongian [4].

[1] Piçarra & Le Menn (1994) *Comunicações do Instituto Geológico e Mineiro* **80**, 15-25. [2] LNEG-LGM (2010) *Geological Map of Portugal, scale* 1:1000 000. [3] Pereira *et al* (2008) *GSL-Special Publication* **297**, 385-408. [4] Pereira *et al* (accepted) *Gondwana Research.*

The importance of a conceptual framework for interpreting tracer data

D. K. SOLOMON[1*], S. D. SMITH[1], B. J. STOLP[1], A. MASSOUDIEH[2]

[1]University of Utah, SLC, USA, kip.solomon@utah.edu (* presenting author)
[2]The Catholic University of America, Washington D.C., USA

Introduction

The interpretation of tracer data are highly dependent on the conceptual framework of the system being investigated. We describe several of our field and laboratory investigations in which the time scale of the tracer was poorly matched to the equilibration time of the system being invesitaged. Numerical modeling has been used to evaluate the extent to which a suite of tracer data can be used to uniquely characterize groundwater flow systems.

Results and Conclusions

A stream tracer test was performed by injecting NaBr for a period of about three times the the in-stream transit time, but steady was still not obtained due to long hyporheic flow paths. This led to estimates of groundwater discharge into the stream that were inflated by a factor of five. A combination of groundwater age data and major ion chemistry in both the stream and groundwater were required to develop a conceptual model that is more consistent with the injected tracer data.

At a geologic time scale we have evaluated the equilibration of helium in pore fluids with quartz grains in an attempt to use the helium content of quartz as a proxy for pore fluids [1]. While pore fluid and quartz helium values agree to within an order of magnitude, we have found differences that are best explained by transients in the groundwater flow systems that are less than the quartz equilibration time (0.01 to 2 MA). A realization of the non-steady effects resulted by applying multiple methods, each with their own time scale.

We have employed multiple tracers/techniques in an attempt to help define the conceptual framework of systems including the residence time distributions with some limited success; however, the introduction of transients as additional unknowns severly complicates obtaining a unique model from even a large suite of tracer data. Such complexities are likely to require large amounts of distributed data within a system, as well as tracer data at discharge points, to even narrow the possible range of conceptual models.

[1] Lehmann, B.W., Waber, H.N.m Tolstikhin, I, Kamensky, I., Gannibal, M., and Kalashnikov, E. (2003) *JGR* **30,** no. 3 p. 4